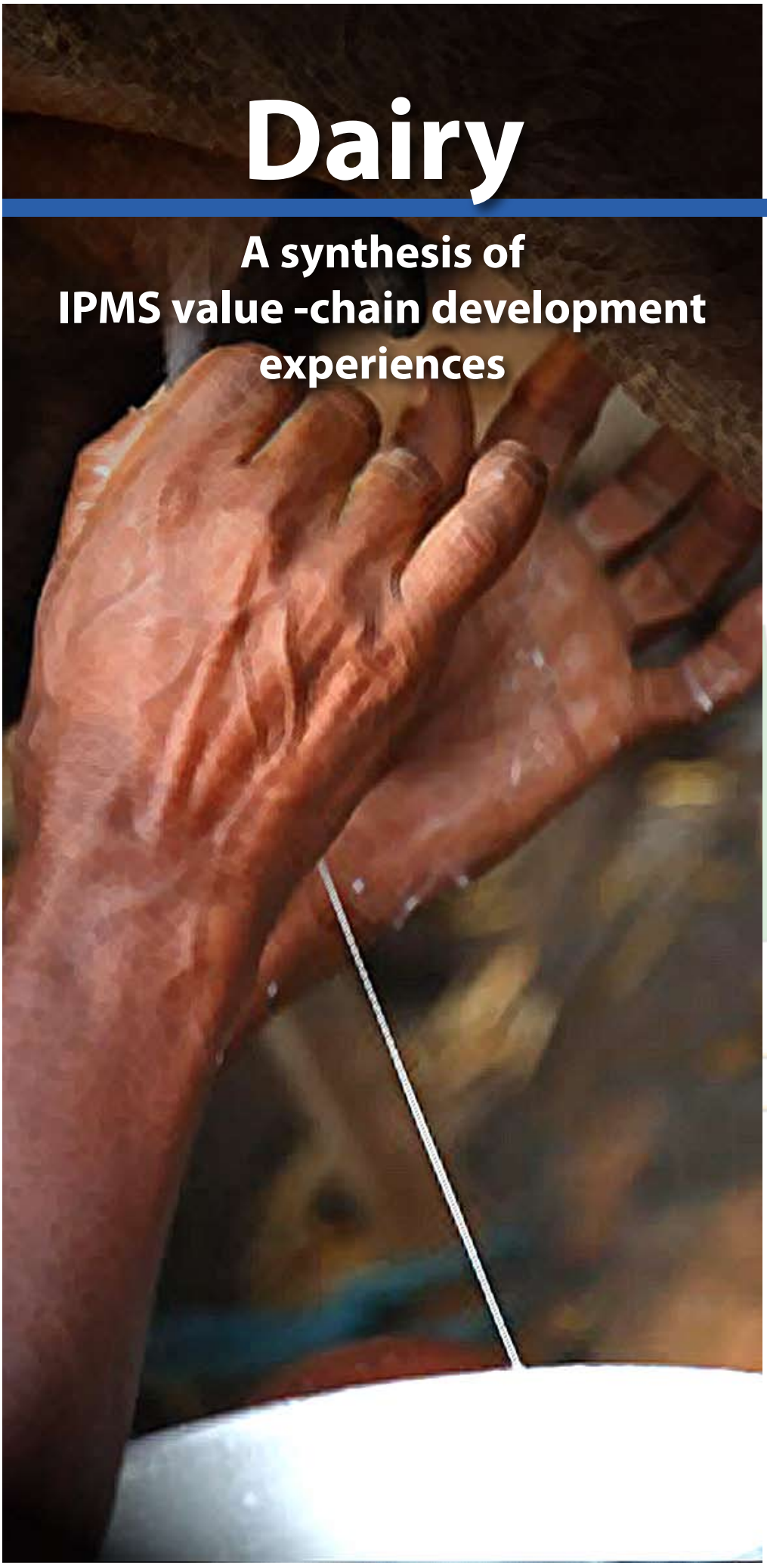
Dairy

A synthesis of IPMS value -chain development experiences



IPMS ETHIOPIA

Background

Ethiopia has the largest cattle population in Africa (estimated at about 49 million heads) of which about 55% are females. Estimated total milk production in 2008/2009 was 2.76 billion litres from about 10 million cows. More than 82% of milk produced from cows is consumed or processed into butter at farm level; leaving very little marketable fluid milk.

Various dairy development projects were launched in different parts of the country. The focus of these, often donor-financed, dairy and livestock development projects have been on breed, feed and health service improvement; promotion of milk processing and formal marketing (large and small scale); infrastructure development; and capacity building for technology generation and transfer. However, despite over six decades of research and development efforts, the dairy sector has not been able to take-off. Per capita milk consumption is about 16 kg/year, which is much lower than African and world per capita averages of 27 kg/year and 100 kg/year, respectively (FAOSTAT, 2009). The annual rate of increase in milk yield is 1.2% against the human population growth rate of 2.1% (CSA, 2008) and the demand-supply variance for fresh milk is ever widening and the per capita consumption is diminishing (MoARD, 2004), resulting in an increase in import of milk and milk products from 3.1 million USD in 2001 to 9.3 million USD in 2008.

Value chain development approach

IPMS introduced a participatory and market-oriented commodity value chain development approach to help boost production and productivity of smallholder farmers. The approach is holistic in that it considers input supply, production, agricultural services, marketing, and business support services as necessary building blocks of commodity development. It stresses business principles (especially market demand) as the driving force for production decisions. Both the public and private sector are seen as critical actors of commodity value chains. Knowledge sharing and capacity building efforts are encouraged to leverage innovations and increase efficiencies. Gender equity is seen as good business. Environment and natural resource enhancing or neutral development is seen as sustainable. Selection of priority commodities, diagnosis of challenges, and design of interventions all follow the above approaches. In the end, implementation of the approach is carried out by public and private sector partners in the areas where the project has been active.

Diagnosis of the dairy value chain

Dairy development was indentified as a priority marketable commodity by stakeholders in seven of the ten IPMS Pilot Learning Woredas (PLWs) namely, Atsbi, Alamata, Fogera, Bure, Ada'a, Mieso and Dale. Key considerations for the selection of dairy development in these Woredas were existing and evolving demand for milk and butter, farmers' market orientation and participation and agro-ecological suitability.

Dairy production in Ethiopia as a whole is anticipated to increase rapidly in response to the fast growing demand for livestock products resulting from increasing human population (especially in urban areas), and rising consumer income. Average milk price increased from Birr 4 per litre in 2005/2006 to Birr 8 per litre in 2008/2009 (200% increase). Average price of dairy cow feed increased from Birr 1 per kg in 2005/2006 to Birr 3 per kg in 2007/2008 (300% increase), and the cost of packaging material increased more than 200% between 2006/07 and 2008/09 (UNIDO report, 2009). The result of an IPMS study on the demand, supply and price trends of milk and butter in urban and peri-urban systems is summarized in Table 1.

Table1. Drivers of demand, supply, and price trends for milk and milk products in urban and peri-urban systems

Trends	Drivers
Increasing demand for raw milk and butter	• Increasing urbanization and population growth • New market outlets due to improved roads • New market outlets due to establishment of processing plants, and supermarket selling local products
Increasing market supply of milk	• Reduced transaction costs due to better roads and collective marketing • Changing attitudes of producers towards selling of milk • New entrants to the enterprise in urban/peri-urban areas • Modest productivity growth, particularly urban/peri-urban areas
Increasing prices of raw milk and butter	• Increasing demand • Increasing production costs, particularly feeds
Increasing price of fodder and feeds (urban)	Increasing fodder and feed scarcity
Limited extent of quality improvements	Quality control by cooperatives, with external technical and material support
Diversified products	Processing cooperatives, with external technical and material support; and increased rural electrification

Subsequent IPMS studies subdivided development potentials of dairy commodities into two location specific production systems:

- Fluid milk system in urban and peri-urban areas
- Local butter production systems in rural areas.

	Existing product	New product
Existing market	Local butter in nearby and distant urban markets Fluid milk for nearby urban markets	
New market		Pasteurized milk and cheese and yoghurt for higher income urban market

Table 2 Dairy marketing matrix

In the urban and peri urban production system, farmers specialized in fluid milk production, targeting consumers in nearby small and large urban centers. Value addition (or processing) of milk, if any, depends on consumer demand and is usually handled by specialized entrepreneurs including cooperatives. In the rural areas, farmers don't specialize in fluid milk/butter production; milk and butter are produced as one of the commodities in the mixed crop and livestock farming system. Processing of milk into local butter is done on the farm and is often carried out by women. Sale of fluid milk in rural areas is not common, except in Mieso where the predominantly Muslim population often consumes milk with coffee. Butter in most of the selected Woredas is sold in the local markets by women.

The following key dairy value chain constraints were identified:

- Lack of government attention for dairy development in the past and existing government and donor efforts are geared to developing the urban and peri urban dairy production system
- Insufficient knowledge and skills among producers and service providers, regarding improved dairy technologies
- Critical shortage of fodder to maintain dairy cows
- Shortage and poor quality of concentrate feeds for high performing dairy animals in the urban and peri urban dairy system
- General shortage of improved dairy animals due to inefficient AI and heifer delivery systems and poor animal husbandry skills, especially proper heat detection and reproduction management
- Limited veterinary service system, especially for the rural dairy production system.
- Variations in demand for dairy products as a result of fasting requirements and shortage of supply during the dry season
- Weak involvement of private sector value chain actors for supply of inputs, credit and processing.

Value chain development

Agricultural extension

Extension for dairy production was hampered by insufficient focus on dairy development and limited knowledge and skills of practitioners in most Woredas. Most extension efforts focused on the peri-urban systems, neglecting the small scale commercial potential of the rural local butter system. The project concentrated on building skills, introducing knowledge, and linking value chain actors to improve the development of the dairy value chain in the selected Woredas.

Skills development

Because of the scarcity of trained manpower at Woreda level, linkages were facilitated with trainers from outside the Woredas to provide in-service training to build capacity of staff and dairy farmers.

Staff from Debre Zeit and Adami Tulu Agricultural Research Centers were linked to Woreda Offices of Agriculture and Rural Development.

A plan for knowledge and skills development on fodder improvement was developed for several of the PLWs.

- Training courses were provided by specialized dairy development partner projects such as Land O' Lakes. In some Woredas, linkages were facilitated with the ILRI/IFAD Fodder Adoption Project to build skills on fodder development

- Regional Bureaus of Agriculture and Rural Development trained paravets
- On-the-job training on processing and cooperative management was given to cooperative staff
- The project also trained selected staff from national and regional Bureaus and Research Institutes on dairy development and advanced technologies for genetic improvement of dairy animals
- The project assisted the Ethiopian Dairy and Meat Technology Institute (EDMTI) in course development and review
- Extension staff were trained on participatory market oriented extension methods, rapid market assessment, gender mainstreaming, and HIV/AIDs mitigation. For many of these topics, training manuals were also developed to facilitate further scaling out and scaling up

Most trainings were of a practical nature, encompassing trainings on treatment of straw, urea molasses block preparation, and fodder development, conservation and utilization, etc.

In many instances, couples (husbands and wives) were trained together to stimulate as well as acknowledge the role of women in dairy development.

Regular visits from SMS and DAs in dairy extension reinforced extension messages and assisted smallholder farmers in the management of their dairy enterprises. Since most of the urban dairy farmers are literate, the project and partner institutes distributed modern dairy management manuals, guidelines and CDs.

Knowledge management

Several interventions were carried out to help stimulate knowledge sharing regarding dairy development. Following are some examples of such endeavors.

Ethiopian Agriculture Portal

The Project and MoARD developed the Ethiopian Agricultural Portal (EAP) The portal (www.eap.gov.et) contains training manuals and documents on dairy production, marketing, and business services. In addition, the project established Woreda Knowledge Centers

(WKCs) in all 10 PLWs and supported 40 FTCs (4 FTCs per PLW) in capacity building and provision of computers and other ICT equipment and facilitated access by DAs, experts, students and others to the Internet in all WKCs and in the model FTCs. For those sites that had difficulty accessing the Internet, offline copies of the EAP were supplied. Currently, the availability of CDMA service has created a better opportunity to access Internet from the FTCs.

Study Tours

To create interest and awareness of market-oriented dairy production, the project facilitated local study tours for producers, agricultural staff and administrators.

A study tour to Uganda and India was organized for the heads of Extension at the MoARD, heads of Bureaus of Agriculture and Director Generals of RARIs and EIAR to share successful experience in market-oriented smallholder dairy development. Another tour was organized to Kenya for the Heads of the Woreda offices of agriculture and rural development to provide exposure about the commercial smallholder dairy value chain system in that country.

Student Theses Research

The project engaged MSc students to do their theses research projects on researchable problems in project PLWs and to identify specific intervention options or solving emerging problems along the dairy value chains in the PLWs. To facilitate broader knowledge sharing, seminars were organized to present student's findings to the stakeholders in the Woredas. Furthermore, the project carried out the documentation of MSc theses and facilitated the publication and dissemination of selected research outputs in the form of working papers.

Field Days

In all Woredas, field days were used to spread knowledge on dairy production within and outside the Woredas, especially on key interventions such as feed resources development. A women farmers field day was organized for the first time in Ada'a where women dairy farmers shared their skills and experience with others.

Presentations on dairy value chain development were often provided at various levels and relevant research outputs were published in working papers.

Involvement and linkages between producers and value chain actors

The project facilitated linkages between dairy value chain and research and development actors through formation of Woreda Advisory and Learning Committees (WALCs) and dairy development platforms. The project, furthermore, encouraged Woreda level actors to participate in similar platforms organized by sister projects such as SNVs dairy platform and the IFAD/ILRI Fodder Innovation Platform. Extension and project staff in the Woredas also facilitated linkages with input/services and marketing organizations as summarized in the following value chain interventions.

Marketing & processing interventions

The project facilitated processing and marketing interventions including

- Facilitating collective action for marketing and processing
- Stimulating demand for dairy products.

Project staff conducted district level dairy value chain assessments with staff of the OoARD and MSc students. The "Farmer-to Farmer Volunteers Organization" from the USA assessed the dairy value chain development potentials at milkshed level in Mekelle, Awassa and Bahir Dar. The results of the studies were used to develop market interventions. Findings indicate that in peri-urban production systems, market channels for fluid milk were usually short since producers mainly sold raw milk directly to consumers or retailers. In some of the larger consumption areas, processing by private dairy and/or cooperatives enterprises took place. Local butter was

sold in rural markets to local consumers and traders who transported and sold it in larger urban centers.

Facilitating collective action for marketing and processing

Whenever local supply of fluid milk exceeds demand, collective action to market and/or process milk into butter becomes an option to reduce transaction cost and/or add value.

- Collective action for marketing was developed in Ada'a and Dale Woredas, where groups of farmers in areas at a considerable distance from the main market outlets organized themselves to enable "bulk" purchasing of milk in one specific location, thereby reducing the transaction costs for transportation and marketing. Women in rural areas in Mieso have traditionally organized themselves in small marketing groups (locally known as Fereka anani), by taking turns to sell each others milk on a daily basis to small rural towns
- The project also supported the government's efforts to establish/strengthen small scale dairy (processing) cooperatives in Alamata, Fogera, Bure, Mieso and Dale

Stimulating demand for dairy products

To raise awareness and stimulate demand for dairy products, the project facilitated celebrations of World Milk Day in Mieso and Metema. It also organized promotion of the benefits of regular milk consumption in Alamata in collaboration with schools in the town. In Fogera, it facilitated the use of skimmed milk by providing free samples to bars and restaurants in the town.

Production interventions

The project facilitated production interventions including

- Fodder and forage development
- Animal improvement (genetic, health, housing & milk quality)

Fodder/forage interventions

The project concentrated on introducing fodder species in peri-urban and rural dairy systems in all PLWs. Species were identified on the basis of their agro-ecological suitability as shown in ILRI's gene bank data base (http://www.tropicalforages.info/). The introduced common grass species included (virus free) Napier, Desho and Rhodes grass and Oats. Leguminous species included perennials such as Sesbania sesban, Leucuaena, tree lucerne and annuals such as cow pea, lablab, pigeon pea, vetch and alfalfa. Most species were introduced on field boundaries and bunds and in back yards. The use of perennials such as Napier and Alfalfa (Medicago sativa) were also promoted where irrigation was available. In some PLWs, intercropping of cowpea/lablab with sorghum was introduced. Some species were also introduced in enclosed grazing area, catchments and gullies, complimenting the physical infrastructure interventions developed by Food Security and SafetyNet programs.

Overgrazed communally used bottom land and grazing areas in Atsbi, Fogera, and Bure were targeted for area enclosure to stimulate the growth of local vegetation and grass species. Such interventions specifically targeted the rural dairy system. New rules and regulations were developed with the communities, taking account of existing user rights. Different organizational/ institutional users' arrangements are observed ranging from rotational grazing to zero grazing with individual and/or group rights. Use of harvested hay was encouraged. Silage making of excess green biomass has not yet started.

Use of crop residues was encouraged, in particular stover from maize and sorghum. The importance of chopping the stover has been realized by famers, but attempts to introduce modern chopping equipment has failed so far because of lack of appropriate equipment. The project also tested the treatment of straw with urea in several PLWs. Use of new/indigenous knowledge on the use of cowpea and haricot bean pod shells and leaves, sweet potato vines and green leaves from sorghum and maize thinning was also encouraged.

The project also introduced urea treatment of straw and Urea Molasses Blocks (UMB) or mixes in Alamata, Fogera, Bure, Ada'a and Mieso.

Animal production interventions

Farmers were assisted with the introduction of improved breeds i.e. Holstein Friesian in the peri-urban areas in most PLWs, where they mostly payed cash; Begait in the peri-urban and rural areas of Alamata (with credit provided by the OoARD) and improved Fogera breeds in Fogera Woreda. The various dairy platforms and partners helped farmers to acquire crossbred cows, supportive services and better market, which encouraged expansion of dairy enterprise and production.

Construction of a stall-feeding unit, record keeping, preparing a farm budget and improved feeding (including use of UMB and urea treated stover) were among the advices given to farmers.

Input supply and service provision interventions

The project facilitated input supply interventions including

- Feed supply (fodder & concentrate)
- Genetic improvement
- Animal health delivery

Feed supply

To introduce fodder species in the woredas, the project facilitated the supply of improved forage species from ILRI's gene bank. The multiplication of species took place in FTCs and on private farms. Seeds of multiplied Rhodes grass and all legumes were disseminated to farmers sometimes with the intervention of donor/government funded programs. Some farmers managed to produce and sell seeds to other farmers and/or private seed producing companies. Desho grass and Napier grass were disseminated to neighboring farmers through clumps/ cuttings, usually free of charge.

To improve the supply of concentrate and feed supplements, the project facilitated linkages between producers, Woreda level concentrate suppliers and some emerging concentrate producers. Most dairy farmers already used wheat bran from local small scale processing facilities and residues from local beer making (Atella). The project also introduced the production and sale of Urea Molasses Blocks or mixtures for producer groups or individuals in Mieso.

Genetic improvement

Studies indicate that the effectiveness/ efficiency of the government's AI services was limited. To ameliorate the problem, a private AI service was introduced by recruiting two young high school graduates from two peri-urban sites in Ada'a Woreda. The two technicians attended a three-month training at Assela TVET with an additional one month apprenticeship at Abernosa ranch. The project provided credit for AI kits with accessories including nitrogen containers of 3.5 liters capacity, insemination gun, gloves, bags, scissors and forceps. Although the AI technicians got semen and nitrogen free of charge from Ada'a OoARD, the technicians charged farmers a service fee of Birr 20 per insemination. The project also provided credit to the Ada'a Dairy co-operative for purchasing AI equipment and accessories in order to enhance its AI service delivery.

The project also tested the use of hormones for estrus synchronization of groups of dairy cows in Alamata Woreda to improve effectiveness and efficiency of AI. Estrus synchronization can improve the efficiency of the AI service, since all the resources can be mobilized over a short period of time to inseminate a large group of animals, rather than the usual one by one insemination over a long period of time.

In areas where AI services were not easily available, the project facilitated the introduction of private bull stations. (e.g. Ada'a in Godino and Denkaka rural Kebeles), Fogera and Alamata.

Animal health delivery

The use of Community animal health workers (CAHWs) was initiated with the objective of filling the gap in coverage by the public animal health service delivery, particularly in remote and less accessible rural Kebeles. CAHWs were trained and supported in accessing the basic equipment, materials and inputs (veterinary drugs), and were deployed to serve their own communities. In Alaba, this intervention was targeted at non dairy animals, however rural farmers who kept dairy animals mainly for subsistence, reportedly also benefitted.

Observable (Measurable) achievements

Production, productivity and income

Fodder production – bottom lands and grazing areas

A study conducted in Atsbi showed that natural forage grasses and legumes established very well in the bottomlands with average biomass yield of about 10 t (DM) ha-1. In the degraded slopes, biomass yield ranged from about 3.0 to 5.0 t (DM) ha-1. After the introduction of enclosure and the cut and carry system in the bottomlands, about 45 different grass and legume species were recorded within the past 2-3 years. Some of the grass species included Agrostis, Andropogon, Avena fatua , Cynodon, Cyperus, Eleusine, Eragrostis, Festuca, Harpachne, Heteropogon, Hyparrhenia, Pennisetum, Setaria spp,. while the cover abundance of palatable legume species such as Trifolium spp., Medicago spp., Lolium spp., Indigofera spp., Lotus spp., and Vicia spp. were significantly improved. Legumes covered about 25-30% of the standing herbage biomass. Farmers harvested green forage three times per year. Although the forage from the slopes had similar composition, it could be harvested only once a year. Survey data indicate that this fodder resource was used primarily for dairy animals.

In Fogera, about 3,456 ha of communal grazing lands was heavily invaded with Asracanta longifolia weed. The project and the Woreda Office of Agriculture and Rural Development staff intervened and mobilized the community to participate in the clearance of weed infested areas and feed resources development for sustainable use of natural resources. Over the last three years (2007 to 2009), a total of 423.73 ha of land has been cleared of the weeds in 17 PAs. In 2009, communities in 5 PAs developed by-laws and agreed to keep 60.2 ha of land under stock exclusion for subsequent use by cut and carry system. The additional fodder was often used for dairy animals. The result of an MSc study/experiment conducted in Fogera pastureland showed that fertilizer application increased the yield of natural pastureland by 36.07%. Fertilizer application at a rate of 46kg/ ha along with 90 days of harvesting (in October) was recommended as this resulted in higher mean dry matter yield of 9.58 t/ha and higher nutritional quality of the Fogera upland natural pasture.

Fodder production – backyard fodder

Several farmers reported using planted species using a cut and carry system to feed their dairy animals during the wet and dry season. It was noted that dry season fodder from planted grasses was only available under irrigation. Desho grass was generally more drought resistant than Napier. Some parts of the harvested legumes, such as stalks and pod shells from cow peas were stored and used during the dry season. Perennials such as Sesbania sesban, Tree lucerne and Leucaena produce foliage during the dry season, which were used by farmers during the wet as well as dry seasons.

Animal production - feeding

The result of on farm dairy cow feeding trials on straw treatment and supplementary feeding clearly showed that supplemented cows produced significantly more milk ($P<0.05$) than those grazed on natural pasture alone (0.45 kg/day). In particular, urea treated wheat straw supplementation was found to be the highest in terms of mean milk yields (2.18 kg/day) and weight gain. The result also show that unless we supplement lactating cows in cases of feed shortage, milk production will decline or completely dry off regardless of the stage of lactation.

Both studies also computed gross margins for the different treatments, which showed positive results. However, the studies did not consider labor cost for making straw silage in pits. The latter inputs are expected to affect the technology adversely, since adoption is so far limited.

Animal productivity

Various project studies provided information on the productivity of local cows and cross bred cows. A detailed study in Mieso showed average milk yield per lactating period of 1.24 litres/ day over a 7.3 month lactation period. A study conducted on urban and peri-urban farmers in the Hawassa milk shed showed that local cows produced about 2 l/day over a 239 day lactation period, while grade cattle produced 9.5 liters/ day over a 232 day lactation period.

Household production and income

A household survey conducted on project farmers in 2007/08 identified a difference in milk production; value dairy products sold by farmers who adopt improved practices (adopters) and those who don't (non adopters).

The Table clearly indicates that the adoption of grade animals plus associated practices had the most significant effect on household milk production, sale of dairy products and butter. Although not statistically significant, adoption of other practices than grade cattle also contributed to increased household milk production, sale of dairy products and butter. The latter is of particular importance since the income derived from butter benefits women.

Average volume of fluid milk produced, dairy products sold and value of butter sold per household (adopters as classified earlier)

Woreda	Farmer type*	Animal type	Obs	Average milk production (lt/year) [a]	Obs	Dairy products sold *(Birr/HH/yr)* [a]	Obs	Value of butter sold *(Birr/HH/yr)* [a]
Atsbi	Adopters	grade	20	2051.4 *** ‡‡‡	20	3701.65 *** ‡‡‡	18	1048.78 * ‡‡
		local	31	666.0 ‡‡	31	688.00 ‡‡	30	638.93
	Non-adopters	local	25	355.8	25	414.48	22	446.46
Alamata	Adopters	grade	21	1137.4 ‡	21	2014.76 * ‡‡	21	1778.57
		local	41	897.7	41	1234.34	38	1069.68
	Non-adopters	local	41	748.1	41	979.05	31	1200.68
Fogera	Adopters	grade	8	2210.0 *** ‡‡‡	8	3614.13 ** ‡‡	4	1706.25
		local	35	677.1	35	489.80	13	1249.46
	Non-adopters	local	38	714.3	38	243.00	13	710.31
Bure	Adopters	grade	0		0		0	
		local	25	407.4 ‡	25	234.20 ‡	11	532.27 ‡
	Non-adopters	local	30	223.6	30	78.17	13	180.38
Ada'a	Adopters	grade	13	4139.2 *** ‡‡‡	13	14566.38 ** ‡‡	4	505.00
		local	19	524.6	19	483.63 ‡	14	586.79
	Non-adopters	local	31	436.2	31	282.13	12	666.67
Mieso	Adopters	grade	0		0		0	
		local	51	1011.4	51	2332.10	32	671.91 ‡‡
	Non-adopters	local	50	777.7	50	1792.58	27	505.22
Dale	Adopters	grade	12	1779.3 * ‡‡‡	12	2860.58 * ‡‡	3	1342.67
		local	52	1085.2 ‡‡‡	52	642.35 ‡	32	565.13 ‡‡
	Non-adopters	local	35	461.4	35	400.37	28	272.64

Note: a for those households who produced milk during the 2007/08 production year.

b Adopters are HHs who at least adopted one of the IPMS interventions.

****, **, and * are significantly different from the mean values of adopters with local cows at 1%, 5% and 10% level, respectively.*

‡‡‡, ‡‡ , and ‡ are significantly different from the mean values of non-adopters with local cows at 1%, 5% and 10% level, respectively.

Input supply and marketing

Genetic improvement dairy animals

No detailed quantitative studies have been conducted on the effect of the various interventions to improve the genetic make up of the dairy animal population. Observations from Ada'a Woreda, on the introduction of private AI services, including efforts made by partner projects show that the role of the public sector in providing AI services in peri urban – rural dairy systems can be taken over by the private sector i.e. out of 825 AI service in 2010, 808 (98%) were provided by private providers, including the Ada'a dairy cooperative. Until 2008, 100% of AI service was provided by the public sector.

The project's attempts in Alamata to improve AI efficiency with estrus synchronization, demonstrated various bottlenecks, which should be taken into account to further develop this approach First of all, since this is a new technology/approach farmers have to properly understand the details of the intervention. In total 88 cows were offered for the hormone treatment but only 38 (43%) were treated. The conditions of the animals' bodies were the main reasons they were rejected. Of the 38 animals treated with hormones, 29 (76%) were artificially inseminated and 5 were serviced by exotic bulls and the rest by local bulls. Bull station operators in Ada'a, Fogera and Alamata were able to operate their services (some were able to charge up to Birr 50 per service), however the spread of disease using this system remains a concern.

Animal health service provision by CAHWs

An MSc study which was conducted in Alaba showed that the service covered different types of animals, including dairy animals; and formally trained CAHWs treated animals from 43% of the sampled households in the study Kebeles. Further, the perception survey data showed that between 70 to 100 % of the respondents, who used the service provided by the CAHWs, were satisfied with the effectiveness and timeliness of the service.

Forage seed/cutting multiplication

The multiplication and distribution of cuttings and seeds, grown on demonstration areas in the different PLWs, was accepted, with some FTCs charging small fees. Part of the customers included government/donor funded projects.

Multiplication of seeds/cuttings by private farmers with free distribution to neighboring farmers is also reportedly working in several PLWs, notably distribution of cow pea seeds in Mieso, Rhodes grass in Bure and Napier grass cuttings in almost all PLWs. Commercial production of seeds by farmers has been initiated but has not resulted in a commercially viable business.

Milk marketing and processing

Collective action for milk marketing from rural to urban areas in Ada'a saw a gradual increase in milk delivered (up to 150 to 200 liters per collection point) and thus contributed to an expansion of the Ada'a milkshed.

Processing of milk in small local cooperatives, worked well in Bure, but was hindered by a lack of commercial orientation and managerial problems in all other PLWs. At the same time, processing/value addition by some of the larger dairy producers in District towns was observed.

Gender

Dairy development has benefitted women through efforts made in capacity development and knowledge management; however this is a gradual change process, especially in the peri-urban fluid milk/butter system. It was noted that women participation in study tours can have a negative effect if such events require an overnight stay.

A significant impact on gender has been achieved in rural fluid milk/local butter system in fodder and health interventions, since women handle the processing and marketing of additional dairy products. In general, they are the ones who keep the money thus earned for regular household expenses.

Environment

In Atsbi, forage groundcover in bottom lands improved to about 70-100% depending on the season and rainfall after intervention compared to 20-30% before intervention. In the slopes, the forage groundcover was about 60-90% in the rainy season after the intervention compared to 5-10% before intervention. In the dry season, forage groundcover was about 50-60% after intervention compared to less than 5% before intervention. The presence of year round forage groundcover protects the soil by canopy cover (more than 5 cm above the soil surface) and contact cover (up to 5 cm above the soil surface). The forage groundcover also protects the soil by slowing runoff and improving water infiltration and the soil deposits any dislodged silts around forage plants. Furthermore, it helps to enrich groundwater and springs developments in down streams. Gullies in the intervened forage sites were stabilized and transformed into productive lands. The stabilization of gullies attributed to soil and water conservation in the upper catchments and growth of in situ forages plants. Improved forage groundcover reduces runoff and evaporation, and increases infiltration. Groundwater was substantially enriched with the appearance of some swampy sites along spring water development downstream which is being used for human and livestock consumption and for high

value crops such as irrigated vegetables production. About 65% of the total grazing bottomlands (8802 ha) and most of the grazing lands in the slopes adapted cut and carry feeding system.

The enclosure/zero grazing management and introduction of fodder species, furthermore contributed to the increase in bee forage vegetation. The zero grazing system also contributed to a reduction in trampling of soils.

Actors and linkages

Several actors have been involved directly or indirectly in market-oriented smallholder dairy development intervention. The key actors included milk groups / cooperatives, private and public veterinary service providers, saving and credit institutions, concentrate feed suppliers, private processors, and milk and product consumers (public/private institutions, restaurant and cafes). The Livestock Production and Development, Animal Health and Cooperative Promotion Departments of WoARD, Food Security Office, and DAs with the FTCs as well as Kebele administration are key local actors. Other important actors include agricultural research and education institutions, NGOs and development projects. The interaction and linkage among these actors to support a given commodity development was observed to be negligible, prior to IPMS interventions. The key actors were brought together and IPMS facilitated the establishment of Woreda Advisory and Learning Committee (WALC) and in some cases, like in the Ada'a PLW, the dairy platform that coordinates actors and leads the innovation processes for sustainability. The establishment of WALC helped to improve the interaction and linkage among actors to a considerable level.

Lessons, challenges and recommendations for scaling out and up

Agricultural extension

Dairy value chain development is a continuous process. It requires new responses in knowledge, skills and interventions and different sets of actors depending on differences in the level of commercialization of households and Woredas and the production system orientation i.e. fluid milk or local butter.

In general, the public sector staff and dairy producers' knowledge and skills required for more commercialized dairy production were inadequate and were therefore augmented with i) study tours, ii) in service training with follow up learning sessions in the field, iii) improved access to knowledge through Woreda Knowledge Centers and FTCs and iv) use of trainers from research and consultants. Both men and women were targeted, which had a positive effect on women's involvement in dairy development.

While the project used innovative approaches to build skills and knowledge of the extension workers and producers; in the long run more attention will have to be paid to develop the educational institutions, charged with the responsibility of "producing" skilled dairy specialists and producers.

A change in public service provision has taken place as a result of the creation of Urban Agriculture Offices. So far, this has affected the quality and availability of the services in urban and peri-urban areas. With increased levels of commercialization, private advisory services may be considered. Indeed an IPMS study shows that it is possible to launch selective privatization of dairy production input supply and animal health service delivery in certain areas

where private service providers are available and where there is effective demand for the service (e.g. in Ada'a milkshed).

Marketing/processing

The project facilitated the processing/ marketing of dairy products in several locations, and supported the government's strategy by introducing small cooperative dairy processing units in small urban centers. It has been observed, however, that almost all the cooperatives suffered from lack of economies of scale and inadequate agro business manpower. It is doubtful that such manpower can be gainfully employed at such low level of production/ processing. A wider milk shed approach should be promoted and pursued in which small geographical locations will become collection centers. The involvement of medium to larger sized commercial dairy farms in processing of milk from small holders at the Woreda level should also be explored.

Production

Farmers who applied improved production technologies, have shown that dairy production is a good and dependable source of livelihood. Even in the rural butter systems, household income gains can be made especially for women Production interventions like backyard fodder and grazing area improvement were successfully introduced by the project and showed a good synergy between natural resource conservation and utilization.

Improved livestock husbandry/ feeding practices with concentrate were successful in most locations, but hampered by inconsistency of quality and supply and unpredictable price fluctuations. Linkages through agro business dealerships with emerging commercial feed companies should be explored in the future to improve economics of scale.

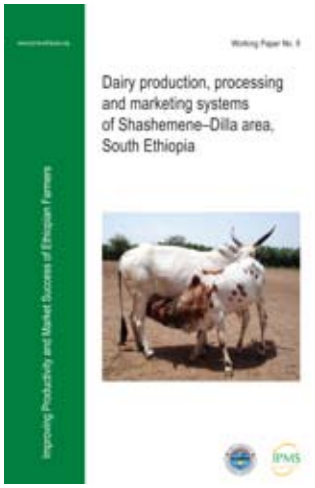
Availability of improved dairy genetic material at affordable prices is still a critical limiting factor in all PLWs.

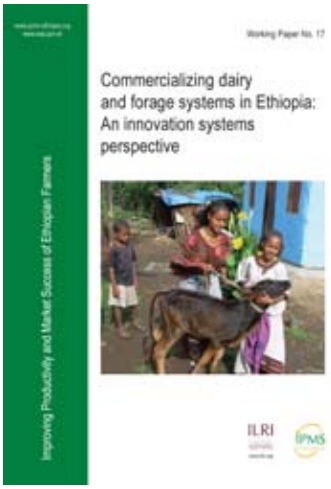
Input/service provision

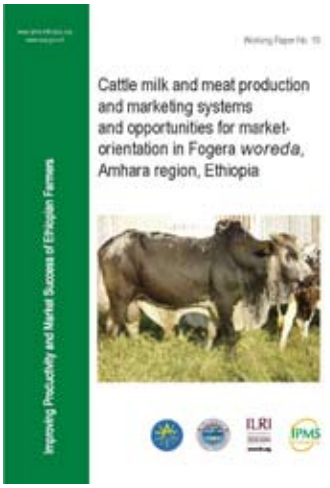
AI and veterinary services are predominantly provided by the government. The project facilitated the introduction of more privatized services such as private bull stations; semi decentralized privatized AI service, and paravets. Most of these efforts will take time to yield tangible outputs. However it is observed that the financial viability of these initiatives are constrained by the fact that business volume is still low (no economies of scale), and competition from government subsidized service provision in the same location. More attention will have to be paid to the use of advanced technology (hormonal oestrus synchronization, use of sexed semen and embryos) coupled with private input supply and service delivery systems supported by credit.

Introduction and testing of new breeds such as the Jersey for the butter system and the Ayrshire and Guernsey for fluid milk systems may expand the choice of farmers in different production systems.

Research outputs and publications







For publications and other documents :

Project Website: http://www.ipms-ethiopia.org

Ethiopian Agriculture Portal: http:www.eap.gov.et

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